

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1 and 2 are views of a conventional disk playback apparatus with an automatic changer;

FIG. 3 is a perspective view of an internal structure of a disk playback apparatus with an automatic changer according to the present invention;

FIG. 4 is a plan view of a rotatable body;

FIG. 5 is a view taken along line V—V of FIG. 4;

FIG. 6 is a plan view of the rotatable body;

FIG. 7 is a plan view of a pair of gripper arms for gripping a cartridge;

FIG. 8 is an elevational view of an address plate;

FIG. 9 is an elevational view of photosensors; and

FIG. 10 is a view explaining how the rotatable body is displaced when turned around.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A disc playback apparatus with an automatic changer according to the present invention will be described below. In the disc playback apparatus, each disc is rotatably housed in a flat rectangular protective cartridge, and played back while being stored in the cartridge.

FIG. 3 shows the disc playback apparatus with an automatic changer, which is generally designated by the reference numeral 101.

As shown in FIG. 3, the disc playback apparatus has a housing 102 in the form of a rectangular parallelepiped. In FIG. 3, the arrow Y indicates a front side of the apparatus, the arrow X a lefthand side of the apparatus, and the arrow Z an upper side of the apparatus. The housing 102 houses therein a storage rack 104 serving as a storage unit for storing a plurality of rectangular cartridges 103 at a constant pitch P, each cartridge 103 holding a rotatable disc to be played back. The cartridges 103 are arrayed vertically (in the direction of the arrow Z).

Two discs process means 107, stacked one on the other, are disposed below the storage rack 104, each including a turntable and recording and/or pickup unit for processing a disc. Each of the disc process means 107 may be substantially the same as proposed in Japanese Patent Application No. 61-165792, for example, filed by the applicant, and will not be described in detail.

Discs stored in the storage rack 104, i.e., cartridges 103 are sequentially selected and fed to the disc process means 107, or returned from the disc process means 107 into the storage rack 104, by a disc draw/feed mechanism.

The disc draw/feed mechanism will now be described below.

A guide shaft 109 extends vertically in the direction in which the cartridges are arrayed in the storage rack 104. A base 110 is slidably mounted on the guide shaft 109. The base 110 can be slidably moved along the guide shaft 109 by a base driving means comprising a toothed belt 111, pulleys 112 (one shown), and a motor 113.

A counterweight 117 as a vertically movable body is disposed near the guide shaft 109, and is guided by another guide shaft (not shown).

To the counterweight 117, there are connected to ends of two wires 127 with their other ends connected to the base 110 through pulleys (not shown) disposed near the upper end of the guide shaft 109. Therefore, the counterweight 117 is guided by the other guide shaft

(not shown) to move relatively to the base 110 when the base 110 is moved.

As illustrated in FIGS. 3 and 4, a spindle 130 extending to the left (in the direction of the arrow X) is rotatably mounted by a bearing 129 from the righthand end of the base 110 which is vertically guided by the guide shaft 109. As shown in FIG. 4, a motor 131 for rotating the spindle 130 is mounted on the base 110. More specifically, a worm wheel 132 is disposed for rotation with the spindle 130, and a worm 133 fitted over the output shaft of the motor 131 is held in mesh with the worm wheel 132.

As shown in FIGS. 5 through 7, a rectangular rotatable body 135 is attached to the free end of the spindle 130 for rotation with the spindle 130 in the direction of the arrow Q shown in FIG. 3. As shown in FIGS. 3, 4, and 5, the rectangular rotatable body 135 comprises front and rear side members 136, 137 as the front and rear sides of the rectangular shape, lefthand and righthand side members 138, 139 as the lefthand and righthand sides of the rectangular shape, and two front and rear pairs of upper and lower guide plates 140, 141 disposed on the upper and lower surfaces of the lefthand and righthand members 138, 139.

A movable chassis 143 is mounted on the rotatable body 135 for movement in lateral directions (the direction of the arrow X and the direction opposite thereto). More specifically, the front and rear side members 136, 137 have guide grooves defined in and extending the full length of the inner side surfaces thereof. A pair of front and rear sliders 144 is slidably fitted in the guide grooves, and the movable chassis 143 is attached to the sliders 144.

A pair of L-shaped gripper arms 146 is swingably mounted on the opposite ends of the movable chassis 143 by means of pins 146a extending vertically (in the direction of the arrow Z and the direction opposite thereto). The gripper arms 146 are swingable in a horizontal plane including the direction of the arrow X and the direction of the arrow Y. The gripper arms 146 serve to grip a cartridge 103. As shown in FIG. 4, the gripper arms 146 have hooks 146b, respectively, for engaging in recesses 103a defined in the cartridge 103. A pair of pusher arms 147 is swingably mounted on the movable chassis 143 by means of pins 147a. The pusher arms 147 are swingable in a plane parallel to the plane in which the gripper arms 146 are swingable. The pusher arms 147 serve to push an end of the cartridge 103.

As illustrated in FIGS. 4 and 5, a movable plate 149 is movably mounted on the rotatable body 135 above the movable chassis 143, the movable plate 149 being reciprocally movable in the same direction as the direction in which the movable chassis is movable. More specifically, a pair of front and rear sliders 150 is slidably held in engagement with the two upper guide plates 140 of the rotatable body 135, and the opposite ends of the movable plate 149 are fixed to the respective sliders 150. A spindle 151 is rotatably mounted on the movable plate 149 and extends in the Y direction of the apparatus, with two pinions 152 being fitted over the opposite ends of the spindle 151. The pinions 152 are in mesh with racks 153, respectively, disposed along the front and rear side members 136, 137. A worm wheel 155 is fitted over an intermediate portion of the spindle 151 and held in mesh with a worm 156a fixed to the output shaft of a motor 156 mounted on the movable plate 149. Therefore, when the motor 156 is energized, the pinions 152 roll on the racks 153 for thereby moving